Application No. 10/511,023
Filed: October 8, 2004
TC Art Unit: 3736
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Please amend the application as follows:

IN THE CLAIMS

Please amend claims 1 and 39 as shown in the Status of the Claims section, *infra*. Additions are underlined and deletions are struckthrough. No new matter has been added.

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STATUS OF THE CLAIMS

1. (Currently amended) A system for assisting the maintenance of balance during standing and gait, comprising:

a plurality of sensors for detecting balance information during standing and gait, wherein said plurality of sensors is configured in a portable layer for wearing against a user's foot bottom during standing and gait by placement under at least one foot of a user, wherein each sensor within said plurality of sensors transduces a detected magnitude of forces applied to said sensor within said plurality of sensors, and wherein said each sensor of said plurality of sensors transmits at least one balance information signal representing said detected magnitude of forces applied to said sensor of said plurality of sensors;

a signal processing subsystem for receiving said at least one balance information signal from said each sensor of said plurality of sensors, and for converting said at least one balance information signal into at least one stimulation control signal, wherein said signal processing subsystem further operates to transmit said at least one stimulation control signal; and

at least one stimulator attachable to a body surface part of said user, responsive to said at least one stimulation control signal, for stimulating said body surface part of the user in a manner indicative of said detected magnitude of forces applied to said each sensor of said plurality of sensors.

2. (Previously presented) The system of claim 1 wherein said plurality of sensors are sensitive to said detected magnitude of forces oriented perpendicular to said plurality of sensors.

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3. (Previously presented) The system of claim 1 wherein said plurality of sensors are sensitive to said detected magnitude of forces oriented parallel to said plurality of sensors.

4. (Previously presented) The system of claim 1 wherein said plurality of sensors are sensitive to said detected magnitude of forces oriented parallel to said plurality of sensors and forces oriented perpendicular to said plurality of sensors.

5. (Original) The system of claim 1 wherein said plurality of sensors are mounted in a shoe.

6. (Original) The system of claim 1, wherein said plurality of sensors are mounted in a stocking.

7. (Original) The system of claim 1; wherein said plurality of sensors are mounted in a sandal.

8. (Original) The system of claim 1, wherein said plurality of sensors are insertable into a shoe.

9. (Original) The system of claim 1, wherein said plurality of sensors are insertable into a stocking.

10. (Original) The system of claim 1, wherein said plurality of sensors are insertable into a sandal.

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11. (Original) The system of claim 1, wherein said plurality of sensors are insertable into skin of said user.

12. (Original) The system of claim 1, wherein said plurality of sensors are insertable under skin of said user.

13. (Original) The system of claim 1, wherein said plurality of sensors are insertable within a body of said user.

14. (Previously presented) The system of claim 1 wherein said signal processing subsystem is further operable to:

convert said at least one balance information signal received from said plurality of sensors into at least one estimate of a magnitude of force applied to a sole of said at least one foot; and

wherein said at least one stimulation control signal encodes said magnitude of force applied to said sole of said at least one foot.

15. (Original) The system of claim 1, wherein said signal processing subsystem is further operable to:

convert said at least one balance information signal into at least one estimate of a position of force applied to a sole of said at least one foot; and

wherein said at least one stimulation control signal encodes said position of force applied to said sole of said at least one foot.

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16. (Original) The system of claim 1 wherein said signal processing subsystem is further operable to:

convert said at least one balance information signal into at least one estimate of an orientation of force applied to a sole of said at least one foot; and

wherein said at least one stimulation control signal encodes said orientation of force applied to said sole of said at least one foot.

17. (Previously presented) The system of claim 1, wherein the signal processing subsystem is further operable to:

convert said at least one balance information signal into at least one estimate of a portion of a total body weight of said user applied to a sole said at least one foot and;

wherein said at least one stimulation control signal encodes said portion of said total body weight of said user applied to said sole of said at least one foot.

18. (Original) The system of claim 1, wherein said signal processing subsystem is further operable to:

determine a magnitude of a resultant reaction force applied to a sole of said at least one foot by

calculating a sum equal to the total force applied to all sensors within said plurality of sensors, and

dividing said sum by a total body weight of said user.

19. (Original) The system of claim 1, wherein said at least one stimulator comprises an array of stimulators securable to a leg of said user.

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20. (Original) The system of claim 1, wherein said at least one stimulator comprises an array of stimulators incorporated into a stocking.

21. (Original) The system of claim 1, wherein said at least one stimulator comprises at least one stimulator implantable into skin of said user.

22. (Original) The system of claim 1, wherein said at least one stimulator comprises at least one stimulator implantable within the body of said user.

23. (Original) The system of claim 22, wherein said at least one stimulator is placeable proximate with at least one sensory neuron of said user.

24. (Original) The system of claim 22, wherein said at least one stimulator is placeable proximate with at least one sensory nerve of said user.

25. (Original) The system of claim 1 wherein said at least one stimulator is operable to produce vibrational stimuli.

26. (Original) The system of claim 1, wherein said at least one stimulator is operable to produce electrical stimuli.

27. (Original) The system of claim 1, wherein said at least one stimulator is operable to produce electrocutaneous stimuli.

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28. (Original) The system of claim 1, wherein said at least one stimulator is operable to produce auditory stimuli.

29. (Original) The system of claim 1, wherein said at least one stimulator is operable to produce visual stimuli.

30. (Original) The system of claim 1, wherein said at least one stimulator is operable to produce thermal stimuli.

31. (Original) The system of claim 1, wherein said at least one stimulator is configured for placement on at least one leg of said user.

32. (Original) The system of claim 1, wherein said at least one stimulator is configured for placement on the trunk of said user.

33. (Original) The system of claim 1, wherein said at least one stimulator is configured for placement on the head of said user.

34. (Original) The system of claim 1, wherein said at least one stimulator includes an array of stimulators mountable proximate to a leg of said user in a plane substantially parallel to a plane of an ipsilateral foot sole.

35. (Original) The system of claim 1 wherein said at least one stimulator is operable to stimulate a sole of said at least one foot.

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36. (Previously presented) The system of claim 1 wherein said at least one stimulator is responsive to said received at least one stimulation control signal such that at least one stimulus characteristic selected from the group comprising amplitude, frequency, and location is indicative of at least one parameter describing forces applied to a sole of said at least one foot.

37. (Previously presented) The system of claim 1, further comprising:

at least one sensor for transducing an angle between at least one foot and the ipsilateral lower leg, and for transmitting an ankle angle signal to said signal processing subsystem; and

wherein said signal processing subsystem receives said ankle signal, and determines said at least one stimulation control signal, at least in part, responsive to said ankle angle signal.

38. (Previously presented) The system of claim 1, further comprising:

at least one sensor for transducing an angle between at least one lower leg and the ipsilateral upper leg, and for transmitting a knee angle signal to said signal processing subsystem; and

wherein said signal processing subsystem receives said knee angle signal, and determines said at least one stimulation control signal, at least in part, responsive to said knee angle signal.

39. (Currently amended) A system for assisting the maintenance of balance during standing and gait, comprising:

at least one sensor for transducing an angle between at least one foot and an ipsilateral lower leg of a user during standing

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and gait, and for transmitting at least one balance information signal representing said angle, wherein said at least one sensor is configured in a portable layer for wearing against a user's foot bottom during standing and gait;

a signal processing subsystem for receiving said balance information signal and for converting said at least one balance information signal into at least one stimulation control signal, and for transmitting said stimulation signal; and

at least one stimulator attachable to a body surface part of said user for receiving said at least one stimulation control signal and for stimulating the body surface part of the user in a manner indicative of said angle represented in said at least one balance information signal.

40. (Original) The system of claim 39, wherein said at least one sensor is operable to determine angles between said foot and said ipsilateral lower leg of said user projected onto a sagittal plane with respect to said user.

41. (Original) The system of claim 39, wherein said at least one sensor is operable to determine angles between said foot and said ipsilateral lower leg of said user projected onto a coronal plane with respect to said user.

42. (Original) The system of claim 39 wherein said at least one sensor is insertable into a shoe.

43. (Original) The system of claim 39 wherein said at least one sensor is insertable into a stocking.

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44. (Original) The system of claim 39 wherein said at least one sensor is mounted within a shoe.

45. (Original) The system of claim 39 wherein said at least one sensor is mounted within a stocking.

46. (Previously presented) The system of claim 39 wherein said signal processing subsystem is further operable to:

convert said at least one balance information signal into at least one estimate of a magnitude of an angle between at least one foot and an ipsilateral lower leg of said user; and

wherein said at least one stimulation control signal encodes said magnitude of said angle between said at least one foot and said ipsilateral lower leg of said user.

47. (Original) The system of claim 39 wherein said at least one stimulator comprises an array of stimulators removably affixed to said ipsilateral lower leg of said user.

48. (Original) The system of claim 39 wherein said at least one stimulator comprises an array of stimulators incorporated into a stocking.

49. (Original) The system of claim 39, wherein said at least one stimulator is implantable into skin of said user.

50. (Original) The system of claim 39, wherein said at least one stimulator is implantable under skin of said user.

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51. (Original) The system of claim 39, wherein said at least one stimulator is implantable within a body of said user.

52. (Original) The system of claim 39, wherein said at least one stimulator is placeable proximate to one or more sensory neurons of said user.

53. (Original) The system of claim 39, wherein said at least one stimulator is placeable proximate to one or more sensory nerves of said user.

54. (Original) The system of claim 39, wherein said at least one stimulator is operable to produce vibrational stimuli.

55. (Original) The system of claim 39, wherein said at least one stimulator is operable to produce electrical stimuli.

56. (Original) The system of claim 39, wherein said at least one stimulator is operable to produce electrocutaneous stimuli.

57. (Original) The system of claim 39, wherein said at least one stimulator is operable to produce auditory stimuli.

58. (Previously presented) The system of claim 39, wherein said at least one stimulator is operable to produce visual stimuli.

59. (Original) The system of claim 39 wherein said at least one stimulator is operable to produce thermal stimuli.

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60. (Original) The system of claim 39, wherein said at least one stimulator is afixable to at least one arm of said user.

61. (Original) The system of claim 39, wherein said at least one stimulator is afixable to a head of said user.

62. (Original) The system of claim 39, wherein said at least one stimulator is afixable to a trunk of said user.

63. (Original) The system of claim 39, wherein said at least one stimulator is placeable on at least one leg of said user in at least one plane approximately parallel to a plane of the ipsilateral foot sole.

64. (Original) The system of claim 39, wherein said at least one stimulator stimulates a sole of at least one foot of said user.

65. (Previously presented) The system of claim 39, wherein said at least one stimulation control signal is indicative of the angle between said least one foot and said ipsilateral lower leg of said user.

66. (Previously presented) The system of claim 39, further comprising:

a plurality of sensors for detecting balance information, wherein said plurality of sensors is configured for placement under at least one foot of a user, wherein each sensor within said plurality of sensors transduces a detected magnitude of forces

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applied to said sensor within said plurality of sensors, and wherein said each sensor within said plurality of sensors transmits at least one balance information signal representing said detected magnitude of forces applied to said each sensor of said plurality of sensors; and

wherein said signal processing subsystem receives said at least one balance information signal, and determines said at least one stimulation control signal, at least in part, responsive to said at least one balance information signal.

67. (Previously presented) The system of claim 39, further comprising:

at least one sensor for transducing an angle between at least one lower leg and the ipsilateral upper leg, and for transmitting a knee angle signal to said signal processing subsystem; and

wherein said signal processing subsystem receives said knee angle signal, and determines said at least one stimulation control signal, at least in part, responsive to said knee angle signal.

68. (Previously presented) The system of claim 1 wherein said at least one stimulation control signal further encodes the time derivative of at least one balance parameter selected from the group comprising the magnitude of the pressure, the radial position of the center of pressure under said foot, and the angular position of said center of pressure under said foot.

69. (Previously presented) The system of claim 1 wherein said at least one stimulation control signal further encodes the time integral of the magnitude of the pressure under said foot.

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70. (Previously presented) The system of claim 39 wherein said at least one stimulation control signal further encodes the time derivatives of the radial position and angular position of the center of pressure under said foot.

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